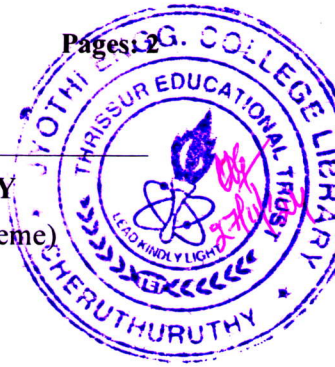


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
 B.Tech Degree S3 (R,S) Examination November 2024 (2019 Scheme)



Course Code: RAT201

Course Name: PROCESSING AND PROPERTIES OF MATERIALS

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions. Each question carries 3 marks*

Marks

- | | | |
|----|---|-----|
| 1 | What is dendritic growth and its significance? | (3) |
| 2 | Explain the effects of grain size, grain size distribution and grain orientation on dislocation of materials. | (3) |
| 3 | What are the applications of diffusion in mechanical engineering? | (3) |
| 4 | What is the role of surface defects on crack initiation? | (3) |
| 5 | What is a semi crystalline polymer? | (3) |
| 6 | What is electron beam hardening? | (3) |
| 7 | Illustrate three applications of composites in engineering field. | (3) |
| 8 | What are Hybrid composites? List two important advantages of Hybrid composites over normal fiber composites. | (3) |
| 9 | Describe the term magnetic anisotropy? | (3) |
| 10 | What is meant by drift velocity and mobility of a free electron? | (3) |

PART B*Answer any one full question from each module. Each question carries 14 marks***Module 1**

- | | | |
|----|---|-----|
| 11 | a) Define Hall - Petch theory and its significance. | (6) |
| | b) Compare slip and twinning modes of plastic deformation in crystals. Also calculate the atomic packing factor of BCC crystal. | (8) |
| 12 | a) Define Schmid's law and critical resolved shear stress | (7) |
| | b) With neat sketch explain the mechanism of crystallization in materials. | (7) |

Module 2

- | | | |
|----|--|-----|
| 13 | a) Describe step by step procedure for metallographic specimen preparation? Name any two etchants. | (7) |
| | b) What are defects? What are the types of defects in materials | (7) |

- 14 a) Define Fick's first and second law of diffusion and explain its mechanisms. (7)
b) Discuss the features of edge and screw dislocations in a crystal plane with neat sketches and mark its burger's vector. (7)

Module 3

- 15 a) Explain Iron-Carbon equilibrium diagram with microstructure and properties. (8)
b) Describe the changes in microstructure with suitable sketch when cooled slowly from austenite to room temperature for eutectoid plain carbon steels. (6)
- 16 a) What is Tempering. Compare austempering and martempering with neat sketch? (8)
b) Illustrate the allotropic transformations of iron with micro structure (6)

Module 4

- 17 a) What are the special features of aluminium based alloy? Give example. (8)
Write its applications
b) What are the needs of development of composites in engineering field? (6)
- 18 a) What are the factors that influence the mechanical properties of semicrystalline polymers (6)
b) What are the special features of copper based alloy? Write its three applications. (8)

Module 5

- 19 a) What is band theory? Explain electrical conductivity of materials based on band theory. (7)
b) What is the influence of temperature on magnetic behavior of materials? (7)
Explain with neat sketch.
- 20 a) Explain the difference between diamagnetism, para-magnetism and ferromagnetism. (7)
b) What are the optical properties of electromagnetic radiations? Explain. (7)
